

NHA	USED ON	REV	DESCRIPTION	DATE	APPROVED
		-	Initial Release	8/16/95	W.H.
		A	Incorporated test results.	8/23/95	W.H.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS XX ± .05 XXX ± .030 FRACTIONS: ± 1/32 ANGLES: ±1°	DRN	W. HAMAKER	8/16/95	PREMIER AVIATION, INC. GRAND PRAIRIE - TEXAS			
	CHK	W. HAMAKER	8/16/95				
	APP	W. HAMAKER	8/16/95	STRUCTURAL TEST PLAN NOSE MOUNTED NIGHTSUN ON A BELL 412EP			
	CONTRACT						
	PREMIER APP			SIZE	CODE IDENT NO.	DWG NO.	
	W. HAMAKER			8/16/95	A	0SUV8	E95-344
	CUST. APP			SCALE:	WT.	SHEET: 1 OF 6	

STC'd PRINT ORIGINAL

STC SH7744SW

PREMIER AVIATION ENGINEERING REPORT NO. E95-344

**STRUCTURAL TEST PLAN
NOSE MOUNTED NIGHTSUN ON A BELL 412EP**

FAA PROJECT NO. SA1277RC-R

STRUCTURAL TEST PLAN NOSE MOUNTED NIGHTSUN ON A BELL 412EP	SIZE A	CODE IDENT NO. 0SUV8	DWG NO. E95-344
	SCALE:	REV: A	SHEET: 2 OF 6

STC'd PRINT ORIGINAL

STC SH7744SW

SUMMARY:

The purpose of this test plan is to demonstrate compliance of the Premier Aviation Nose Mounted Nightsun/Starburst Installation with the applicable Federal Aviation Regulations for structural integrity. The ultimate goal of the project is FAA approval in the form of a Supplemental Type Certificate for Bell Helicopter Textron (BHT) Models 412 and 412EP helicopters. The applicable regulations for BHT 412 and 412EP helicopters is Federal Airworthiness Regulation (FAR) Part 29, through Amendment 2. Successful completion of the tests described herein is required prior to releasing the modified aircraft for FAA TIA Flight Testing. The FAA Rotorcraft Certification Office Project Engineer shall be provided the opportunity to witness the tests. At the option of ASW-170, the static test witnessing may be delegated to an FAA Designated Engineering Representative.

REFERENCES:

1. FAR Part 29: 29.303, 29.307, 29.337, and 29.561.
2. Premier Aviation drawings B82-13016, "Searchlight System Installation" and B30-13017, "Nose Mounted Nightsun/Starburst Installation".
3. STC SH7979SW, Installation of a Nose Mounted FLIR 2000 A/B Imager, in accordance with SFENA Drawing B32-13002.
4. Premier Aviation Engineering Report E90-234, "Static Test of the Nose-Mounted FLIR System 2000 Installed on the BHTI 412 Helicopter".
5. STC SH7744SW; Installation of a Belly Mounted SX-16 or an SX-5 Nightsun System in accordance with Premier Master Drawing List B00-13014.
6. Premier Aviation Engineering Report E93-304, "Static Test of the Belly-Mounted SX-16 Nightsun Installed on the BHTI 412 Helicopter".

TEST METHOD:

The test method follows the minimum requirements of FAR 29.561 for emergency landing conditions. Additionally, the drag force that occurs on the externally mounted Nightsun will also be considered. The successful completion of the tests described herein will demonstrate the structural integrity of the Premier Aviation Nose Mounted Nightsun/Starburst Installation.

The limit loads shall be applied in the direction noted, where the direction is specified with respect to the test article as it is to be installed on the aircraft. The limit loads shall be to at least the magnitude specified, and held for at least 15 seconds. The load shall then be released, and the test article inspected for determination of any evidence of permanent yielding or detrimental deformation.

The ultimate loads shall be applied in the direction noted, where the direction is specified with respect to the test article as it is to be installed on the aircraft. The ultimate loads shall be to at least the magnitude specified, and held for at least 3 seconds. The load shall then be released, and the test article inspected for determination of any evidence of failure.

STRUCTURAL TEST PLAN NOSE MOUNTED NIGHTSUN ON A BELL 412EP	SIZE A	CODE IDENT NO. 0SUV8	DWG NO. E95-344
	SCALE:	REV: A	SHEET: 3 OF 6

STC'd PRINT ORIGINAL

STC SH7744SW

TEST SETUP:

The test article shall be an FAA conformed Premier Aviation Nose Mounted Nightsun installed on a civil certificated BHT 412EP helicopter. To preclude any possible damage to the Nightsun due to static load testing of the mount, it will be removed from the mounting dovetail. A test fixture will be bolted to the dovetail for testing purposes. All test loads will be applied to the test fixture, simulating the center of gravity of the Nightsun.

All test instrumentation shall be calibrated. Test equipment may be previously weighed bags of sand, or equivalent, a calibrated spring scale, or a calibrated load cell. The spring and/or load cell shall have accommodations for pulling or pushing on the test article as specified under test procedures.

TEST LOADS:

The test loads to be applied to the installation of the Nose Mounted Nightsun/Starburst Installation are described below.

Drag Load

The drag load is calculated as follows:

$$D = \frac{1}{2}\rho V^2 SC_D \quad \text{where}$$

D = drag force in pounds,

ρ = air density = 0.002377 slugs/ft³

V = velocity = 1.1V_{NE} = 1.1 × 140 kts. = 154 kts. = 260 ft/sec

S = frontal area = 1.833 ft²

CD = drag coefficient = 1.12 (Ref. Hoerner, Fluid Dynamic Drag, p. 8-3, Fig. 7)

$$D_{\text{LIMIT}} = 0.5 \times 0.002377 \times 260^2 \times 1.833 \times 1.12 = 165 \text{ lbs.}$$

$$D_{\text{ULTIMATE}} = D_{\text{LIMIT}} \times 1.5 = 248 \text{ lbs.}$$

Forward Load

The weight of the SX-16 Nightsun is 37 pounds and the weight of the mounting provision is approximately 3 pounds. The ultimate inertial forward load, as defined by FAR 29.561, is 4 times the weight of the SX-16 and the mounting provisions.

$$\text{Forward Ultimate Load} = 4g \times 40 \text{ lbs.} = 160 \text{ lbs.}$$

Downward Load

As defined by FAR 29.337, the limit and ultimate maneuvering loads are:

STRUCTURAL TEST PLAN NOSE MOUNTED NIGHTSUN ON A BELL 412EP	SIZE	CODE IDENT NO.	DWG NO.
	A	OSUV8	E95-344
	SCALE:	REV: A	SHEET: 4 OF 6

STC'd PRINT ORIGINAL

STC SH7744SW

Limit Maneuvering Load = $(37 \text{ lbs} + 3 \text{ lbs}) \times 3.5g = 140 \text{ lbs}$

Ultimate Maneuvering Load = Limit Maneuvering Load $\times 1.5 = 210 \text{ lbs}$

TEST PROCEDURES:

The ultimate forward load is less than the ultimate drag load. Therefore, the test article will be tested to the ultimate drag load. The ultimate drag load shall be applied to the test fixture at a location that is 15.30 inches below the dovetail, or an equivalent moment shall be applied to the fixture. The ultimate drag load shall be applied and held statically for at least 3 seconds and then released. The test article shall be inspected for any evidence of failure.

The ultimate maneuvering load does not exceed the load previously tested and approved for the mounting dovetail (reference STC SH7979SW, Installation of a Nose Mounted FLIR 2000 A/B Imager, in accordance with SFENA Drawing B32-13002 and Premier Aviation Engineering Report E90-234, "Static Test of the Nose-Mounted FLIR System 2000 Installed on the BHTI 412 Helicopter"). Therefore, the test article will not be retested to this load.

TEST RESULTS:

Statement of Conformity

A MIDO conformity inspection of the test article was performed by Bill Jewel, DAR, prior to the test. Official witnessing of the tests was delegated to Herb Waldrup, DER. The test article and rig were inspected by Mr. Waldrup and was found to be acceptable for the tests. The tests were conducted at the Premier Aviation facilities located in Grand Prairie, Texas, on Friday, August 18, 1995. The test aircraft was Bell 412EP serial number 36105. Premier Aviation employees witnessing the test were Rick Reynolds, representing the Engineering department, Nelson Bivins, representing Quality Control, and Tom Healy, representing Manufacturing.

Recorded Data and Comments

Limit and Ultimate loads were applied according to the test plan. Target and actual loads are listed below (all loads are in lbs.).

<u>Load Direction</u>	<u>Load Type</u>	<u>Target Load</u>	<u>Actual Load</u>
Rear Drag Load	Limit	165	168
Rear Drag Load	Ultimate	248	269

The static load was applied using a Dayton Model 4Z312 ratchet puller in line with an Intercomp Model JW-5 load cell. Load cell data was viewed using an Intercomp Model AC100 Central Processing Unit. Calibration of the load cell and central processing unit was last performed on August 14, 1995 by J.P. Bowlin Co.

STRUCTURAL TEST PLAN NOSE MOUNTED NIGHTSUN ON A BELL 412EP	SIZE	CODE IDENT NO.	DWG NO.
	A	0SUV8	E95-344
	SCALE:	REV: A	SHEET: 5 OF 6

STC'd PRINT ORIGINAL

STC SH7744SW

The limit drag load was applied to the test fixture and held for 15 seconds. The load was released, the test article was inspected and found to be satisfactory. The ultimate drag load was applied to the test fixture for 3 seconds then released. The actual load applied was 269 pounds at a point 15.3 inches below the dovetail. Figures 1 and 2 show the location and application of the applied loads. No deformation, damage, or failure of the Nose Mounted Nightsun/Starburst Installation was found after application of the limit or ultimate loads.

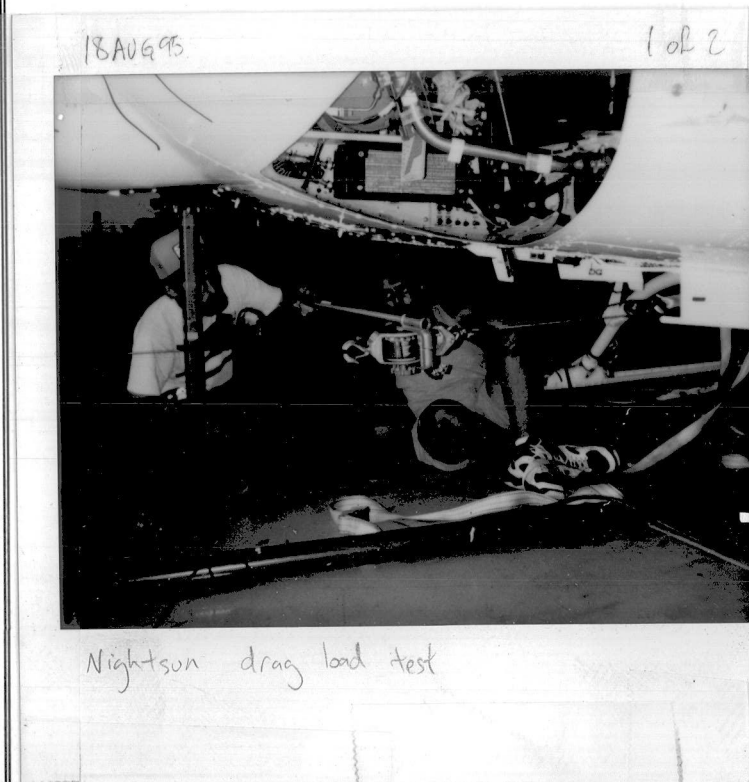


Figure 1. Application of Limit Load.



Figure 2. Application of Ultimate Load.

CONCLUSIONS:

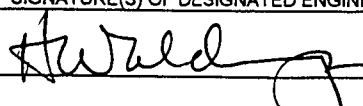
As demonstrated and substantiated by these static load tests, the Premier Aviation Nose Mounted Nightsun/Starburst Installation design aspects and its installation in Bell 412EP aircraft are satisfactory for structural loading considerations.

The tests were considered successful because there was no evidence of permanent deformation from the applied limit load, and no failure of the Nose Mounted Nightsun/Starburst Installation structure after application of the full ultimate load specified.

STRUCTURAL TEST PLAN NOSE MOUNTED NIGHTSUN ON A BELL 412EP	SIZE A	CODE IDENT NO. 0SUUV8	DWG NO. E95-344
	SCALE:	REV: A	SHEET: 6 OF 6

STC'd PRINT ORIGINAL

STC SH7744SW

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION			DATE
STATEMENT OF COMPLIANCE WITH THE FEDERAL AVIATION REGULATIONS			25 AUGUST, 1995
AIRCRAFT OR AIRCRAFT COMPONENT IDENTIFICATION			
MAKE	MODEL NO.	TYPE (Airplane, Radio, Helicopter, etc.)	NAME OF APPLICANT
BELL HELICOPTER	412 & 412EP	HELICOPTER	PREMIER AVIATION
LIST OF DATA			
IDENTIFICATION	TITLE		
E95-344, REV. A, DATED 08/23/95	STRUCTURAL TEST PLAN-NOSE MOUNTED NITESUN ON A BELL 412.		
	-----END-----		
NOTE 1.	THIS APPROVAL IS FOR STRUCTURAL DATA ONLY AND DOES NOT CONSTITUTE QUALITY APPROVAL OR RETURN TO SERVICE.		
NOTE 2.	THIS APPROVAL IS FOR THE TEST RESULTS. DER WAS DELEGATED BY TOM HENRY TO WITNESS THE TEST.		
PURPOSE OF DATA			
APPROVE DATA FOR STC REVISION (FAA PROJECT SA1277RC-R)			
APPLICABLE REQUIREMENTS (List specific sections)			
FAR 29, PARA. 29.301, 29.303, 29.305, 29.307, 29.337, 29.561, 29.601, 29.603, 29.605, 29.607, 29.609 AND 29.865.			
CERTIFICATION - Under authority vested by direction of the Administration and in accordance with conditions and limitations of appointment under Part 183 of the Federal Aviation Regulations, data listed above and on attached sheets numbered _____ have been examined in accordance with established procedures and found to comply with applicable requirements of the Federal Aviation Regulations.			
I (We) Therefore <input checked="" type="checkbox"/> Recommend approval of these data <input checked="" type="checkbox"/> Approve these data			
SIGNATURE(S) OF DESIGNATED ENGINEERING REPRESENTATIVE(S)		DESIGNATION NUMBERS(S)	CLASSIFICATION(S)
 HERB WALDRUP		SW-530	STRUCTURAL

STC SH7744SW

NHA	USED ON	REV	DESCRIPTION	DATE	APPROVED
		-	Initial Release	8/16/95	WAL

HISTORY
FILE COPY
 ECD # Dir Dwg Chg
8-23-95

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS XX ± .05 XXX ± .030 FRACTIONS: ± 1/32 ANGLES: ±1°	DRN	<u>W. Hamaker</u>	<u>8/16/95</u>	PREMIER AVIATION, INC. GRAND PRAIRIE - TEXAS		
	CHK					
	APP	<u>W. Hamaker</u>	<u>8/16/95</u>	STRUCTURAL TEST PLAN NOSE MOUNTED NIGHTSUN ON A BELL 412EP		
	CONTRACT					
	PREMIER APP	<u>W. Hamaker</u>	<u>8/16/95</u>	SIZE	CODE IDENT NO.	DWG NO.
	CUST. APP		A	OSUV8	E95-344	
			SCALE:	WT.	SHEET: 1 OF 5	

ORIGINAL

E95-344 (Rev -)

0180

0120
APR 11 1964
FIRE 0000
MIDNIGHT

PREMIER AVIATION ENGINEERING REPORT NO. E95-344

**STRUCTURAL TEST PLAN
NOSE MOUNTED NIGHTSUN ON A BELL 412EP**

FAA PROJECT NO. SA1277RC-R

HISTORY
FILE COPY
ECD # *Dir Dwg Chg*
8-23-95

STRUCTURAL TEST PLAN NOSE MOUNTED NIGHTSUN ON A BELL 412EP	SIZE A	CODE IDENT NO. 0SUV8	DWG NO. E95-344
	SCALE:	REV: -	SHEET: 2 OF 5

ORIGINAL

SUMMARY:

The purpose of this test plan is to demonstrate compliance of the Premier Aviation Nose Mounted Nightsun/Starburst Installation with the applicable Federal Aviation Regulations for structural integrity. The ultimate goal of the project is FAA approval in the form of a Supplemental Type Certificate for Bell Helicopter Textron (BHT) Models 412 and 412EP helicopters. The applicable regulations for BHT 412 and 412EP helicopters is Federal Airworthiness Regulation (FAR) Part 29, through Amendment 2. Successful completion of the tests described herein is required prior to releasing the modified aircraft for FAA TIA Flight Testing. The FAA Rotorcraft Certification Office Project Engineer shall be provided the opportunity to witness the tests. At the option of ASW-170, the static test witnessing may be delegated to an FAA Designated Engineering Representative.

REFERENCES:

1. FAR Part 29: 29.303, 29.307, 29.337, and 29.561.
2. Premier Aviation drawings B82-13016, "Searchlight System Installation" and B30-13017, "Nose Mounted Nightsun/Starburst Installation".
3. STC SH7979SW, Installation of a Nose Mounted FLIR 2000 A/B Imager, in accordance with SFENA Drawing B32-13002.
4. Premier Aviation Engineering Report E90-234, "Static Test of the Nose-Mounted FLIR System 2000 Installed on the BHTI 412 Helicopter".
5. STC SH7744SW, Installation of a Belly Mounted SX-16 or an SX-5 Nightsun System in accordance with Premier Master Drawing List B00-13014.
6. Premier Aviation Engineering Report E93-304, "Static Test of the Belly-Mounted SX-16 Nightsun Installed on the BHTI 412 Helicopter".

TEST METHOD:

The test method follows the minimum requirements of FAR 29.561 for emergency landing conditions. Additionally, the drag force that occurs on the externally mounted Nightsun will also be considered. The successful completion of the tests described herein will demonstrate the structural integrity of the Premier Aviation Nose Mounted Nightsun/Starburst Installation.

The limit loads shall be applied in the direction noted, where the direction is specified with respect to the test article as it is to be installed on the aircraft. The limit loads shall be to at least the magnitude specified, and held for at least 15 seconds. The load shall then be released, and the test article inspected for determination of any evidence of permanent yielding or detrimental deformation.

The ultimate loads shall be applied in the direction noted, where the direction is specified with respect to the test article as it is to be installed on the aircraft. The ultimate loads shall be to at least the magnitude specified, and held for at least 3 seconds. The load shall then be released, and the test article inspected for determination of any evidence of failure.

HISTORY
FILE COPY
ECD # *Dir Doug Chy*
8-23-95

STRUCTURAL TEST PLAN NOSE MOUNTED NIGHTSUN ON A BELL 412EP	SIZE	CODE IDENT NO.	DWG NO.
	A	OSUV8	E95-344
	SCALE:	REV: -	SHEET: 3 OF 5

ORIGINAL

174121017

174121017

174121017

174121017

174121017

TEST SETUP:

The test article shall be an FAA conformed Premier Aviation Nose Mounted Nightsun installed on a civil certificated BHT 412EP helicopter. To preclude any possible damage to the Nightsun due to static load testing of the mount, it will be removed from the mounting dovetail. A test fixture will be bolted to the dovetail for testing purposes. All test loads will be applied to the test fixture, simulating the center of gravity of the Nightsun.

All test instrumentation shall be calibrated. Test equipment may be previously weighed bags of sand, or equivalent, a calibrated spring scale, or a calibrated load cell. The spring and/or load cell shall have accommodations for pulling or pushing on the test article as specified under test procedures.

TEST LOADS:

The test loads to be applied to the installation of the Nose Mounted Nightsun/Starburst Installation are described below.

Drag Load

The drag load is calculated as follows:

$$D = \frac{1}{2}\rho V^2 S C_D \quad \text{where}$$

D = drag force in pounds,

ρ = air density = 0.002377 slugs/ft³

V = velocity = 1.1V_{NE} = 1.1 × 140 kts. = 154 kts. = 260 ft/sec

S = frontal area = 1.833 ft²

CD = drag coefficient = 1.12 (Ref. Hoerner, Fluid Dynamic Drag, p. 8-3, Fig. 7)

$$D_{\text{LIMIT}} = 0.5 \times 0.002377 \times 260^2 \times 1.833 \times 1.12 = 165 \text{ lbs.}$$

$$D_{\text{ULTIMATE}} = D_{\text{LIMIT}} \times 1.5 = 248 \text{ lbs.}$$

Forward Load

The weight of the SX-16 Nightsun is 37 pounds and the weight of the mounting provision is approximately 3 pounds. The ultimate inertial forward load, as defined by FAR 29.561, is 4 times the weight of the SX-16 and the mounting provisions.

$$\text{Forward Ultimate Load} = 4g \times 40 \text{ lbs.} = 160 \text{ lbs.}$$

Downward Load

As defined by FAR 29.337, the limit and ultimate maneuvering loads are:

HISTORY
FILE COPY
ECO # *Dir Dwg Chg*
8-23-95

STRUCTURAL TEST PLAN NOSE MOUNTED NIGHTSUN ON A BELL 412EP	SIZE	CODE IDENT NO.	DWG NO.
	A	0SUV8	E95-344
	SCALE:	REV: -	SHEET: 4 OF 5

ORIGINAL

Limit Maneuvering Load = $(37 \text{ lbs} + 3 \text{ lbs}) \times 3.5g = 140 \text{ lbs}$

Ultimate Maneuvering Load = Limit Maneuvering Load $\times 1.5 = 210 \text{ lbs}$

TEST PROCEDURES:

The ultimate forward load is less than the ultimate drag load. Therefore, the test article will be tested to the ultimate drag load. The ultimate drag load shall be applied to the test fixture at a location that is 15.30 inches below the dovetail, or an equivalent moment shall be applied to the fixture. The ultimate drag load shall be applied and held statically for at least 3 seconds and then released. The test article shall be inspected for any evidence of failure.

The ultimate maneuvering load does not exceed the load previously tested and approved for the mounting dovetail (reference STC SH7979SW, Installation of a Nose Mounted FLIR 2000 A/B Imager, in accordance with SFENA Drawing B32-13002 and Premier Aviation Engineering Report E90-234, "Static Test of the Nose-Mounted FLIR System 2000 Installed on the BHTI 412 Helicopter"). Therefore, the test article will not be retested to this load.

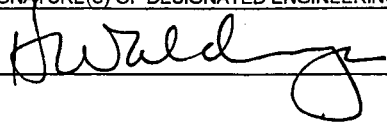
TEST RESULTS:

CONCLUSIONS:

HISTORY
FILE COPY
ECO # *Disc Devg Chg*
B-23-25

STRUCTURAL TEST PLAN NOSE MOUNTED NIGHTSUN ON A BELL 412EP	SIZE A	CODE IDENT NO. 0SUV8	DWG NO. E95-344
	SCALE:	REV: -	SHEET: 5 OF 5

ORIGINAL

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION			DATE 04 AUGUST, 1995
STATEMENT OF COMPLIANCE WITH THE FEDERAL AVIATION REGULATIONS			
AIRCRAFT OR AIRCRAFT COMPONENT IDENTIFICATION			
MAKE BELL HELICOPTER	MODEL NO. 412 & 412EP	TYPE (Airplane, Radio, Helicopter, etc.) HELICOPTER	NAME OF APPLICANT PREMIER AVIATION
LIST OF DATA			
IDENTIFICATION	TITLE		
E95-344, REV. IR, DATED 08/16/95	STRUCTURAL TEST PLAN-NOSE MOUNTED NITESUN ON A BELL 412.		
	-----END-----		
NOTE 1.	THIS APPROVAL IS FOR STRUCTURAL DATA ONLY AND DOES NOT CONSTITUTE QUALITY APPROVAL OR RETURN TO SERVICE.		
PURPOSE OF DATA APPROVE DATA FOR STC REVISION (FAA PROJECT ST1277RC-R)			
APPLICABLE REQUIREMENTS (List specific sections) FAR 29, PARA. 29.301, 29.303, 29.305, 29.307, 29.337, 29.561, 29.601, 29.603, 29.605, 29.607, 29.609 AND 29.865.			
CERTIFICATION - Under authority vested by direction of the Administration and in accordance with conditions and limitations of appointment under Part 183 of the Federal Aviation Regulations, data listed above and on attached sheets numbered _____ have been examined in accordance with established procedures and found to comply with applicable requirements of the Federal Aviation Regulations. I (We) Therefore <input checked="" type="checkbox"/> Recommend approval of these data <input type="checkbox"/> Approve these data			
SIGNATURE(S) OF DESIGNATED ENGINEERING REPRESENTATIVE(S)		DESIGNATION NUMBERS(S)	CLASSIFICATION(S)
 HERB WALDRUP		SW-530	STRUCTURAL

MS 442 HAS DIS STC SH 7744 SW